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|-------------------------------|------------------------|---------------------|--|
| Notice of Allowability | Application No. | Applicant(s) | |
| | 10/679,343 | MATSUO ET AL. | |
| | Examiner | Art Unit | |
| | Tiffany A. Fetzner | 2859 | |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to 01/18/2005 and the telephonic interviews of 03/04/2005, 04/07/05, and 04/12/05.
2. ☒ The allowed claim(s) is/are 1,4,6-8,12 and 14-16.
3. ☐ The drawings filed on _____ are accepted by the Examiner.
4. ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 - a) ☒ All b) ☐ Some* c) ☐ None of the:
 1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
 6. ☒ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
 - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
 - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
 - (b) ☒ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date 04/16/2005.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
7. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

- | | |
|---|---|
| 1. <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 5. <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 2. <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 6. <input checked="" type="checkbox"/> Interview Summary (PTO-413), Paper No./Mail Date <u>04/16/2005.</u> |
| 3. <input type="checkbox"/> Information Disclosure Statements (PTO-1449 or PTO/SB/08), Paper No./Mail Date _____ | 7. <input checked="" type="checkbox"/> Examiner's Amendment/Comment |
| 4. <input type="checkbox"/> Examiner's Comment Regarding Requirement for Deposit of Biological Material | 8. <input checked="" type="checkbox"/> Examiner's Statement of Reasons for Allowance |
| | 9. <input type="checkbox"/> Other _____ |

Examiner's Amendment

1. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it **MUST** be submitted no later than the payment of the issue fee.
2. Authorization for this examiner's amendment was given in a telephone interview with **Attorney Susan A. Wolffe Reg. No. 33,58** on April 7th 2005, and April 12th 2005 along with authorization to charge any necessary fees to applicant's deposit account.
3. The application has been amended as follows:

A) Replace claim 1 of the January 18th 2005 amendment with the following
Examiner amended claim 1:

Claim 1 --- A method for processing magnetic resonance imaging image information wherein a magnetic resonance spectral intensity value is measured **at each of a plurality of measuring points that are arranged at predetermined intervals along a lengthwise direction, a crosswise direction and a height direction on a bone structure to be measured**, comprising

obtaining magnetic resonance imaging (**MRI**) image information as a set of the magnetic resonance spectral intensity values measured **at each of the plurality of measuring points that are arranged at predetermined intervals along a lengthwise direction, a crosswise direction and a height direction on said bone structure by using** two kinds of spectral intensity measuring methods respectively with respect to the bone structure to be measured, the spectral intensity measuring methods comprising:

a magnetic longitudinal relaxation (T1) measurement and a magnetic transverse relaxation (T2) measurement;

three-dimensionally aligning the magnetic resonance imaging (MRI) image information obtained by the magnetic longitudinal relaxation (T1) measurement with the magnetic resonance imaging (MRI) image information obtained by the magnetic transverse relaxation (T2) measurement and

obtaining by interpolation another set of spectral intensity values of the magnetic resonance imaging image information for both the magnetic longitudinal relaxation (T1) measurement and the magnetic resonance imaging image information by the magnetic transverse relaxation (T2) measurement, at the same points as the plurality of measuring points used for said predetermined intervals along a lengthwise direction, a crosswise direction and a height direction on said bone structure, and

deriving information showing the bone structure as new MRI image information by performing a linear calculation between the set of spectral intensity values obtained by the magnetic longitudinal relaxation (T1) measurements and the set of spectral intensity values obtained by the magnetic transverse relaxation (T2) measurements at each of the plurality of measuring points that are arranged at said predetermined intervals along a lengthwise direction, a crosswise direction and a height direction on said bone structure. ---

B) Cancel Claim 2

C) Cancel Claim 3

D) Replace claim 4 of the January 18th 2005 amendment with the following Examiner amended claim 4:

Claim 4 ---The method for processing magnetic resonance imaging image information described in **claim 1** further comprising obtaining magnetic resonance imaging image information by a nuclear density spectral intensity measurement method.

E) Cancel Claim 5

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F) Replace claim 6 of the January 18th 2005 amendment with the following
Examiner amended claim 6:

Claim 6 --- The method for processing magnetic resonance imaging image information in **claim 1** wherein the magnetic resonance spectral intensity values each correspond to a hydrogen nucleus magnetic resonance spectral intensity value. ---

G) Replace claim 7 of the January 18th 2005 amendment with the following
Examiner amended claim 7:

Claim 7 --- The method for processing magnetic resonance imaging image information described in **claim 1**, further comprising comparing the new MRI image information obtained by the linear calculation of the spectral intensity values at each of the corresponding measuring points as a respective image obtained by an X-ray computed tomography. ---

H) Replace claim 8 of the January 18th 2005 amendment with the following
Examiner amended claim 8:

Claim 8 --- A magnetic resonance imaging system that is used in the method for processing magnetic resonance imaging image information described in **claim 1**, further comprising:

an information obtaining portion that obtains magnetic resonance imaging image (MRI) information from a living body by magnetic longitudinal relaxation (T1) measurement;

a first obtained image information-storing portion that stores the magnetic resonance imaging (MRI) image information obtained by the information-obtaining portion;

a second obtained image information-storing portion that stores magnetic resonance imaging image (MRI) information obtained from a living body by a magnetic transverses relaxation (T2) measurement;

an interpolating processing portion that three-dimensionally aligns the magnetic resonance imaging (MRI) image information stored in the first obtained image information-storing portion with the magnetic resonance imaging (MRI) image information stored in the second obtained image information-storing portion; and

wherein the interpolating processing portion also obtains spectral intensity values with respect to each of the magnetic resonance imaging (MRI) image information measurements stored in the first obtained image information storing portion and the magnetic resonance imaging (MRI) image information measurements stored in the second obtained image information-storing portion at the same respective measuring points

a linear calculation portion that conducts a linear calculation based on respective spectral intensity values at each of the measuring points;

a calculated result image information-storing portion that stores information showing a bone structure as a new image as a result of the linear calculation portion; and

an image output portion that outputs the new image based on the image information stored in the calculated result image information-storing portion. ---

I) Cancel Claim 9

J) Cancel Claim 10

K) Cancel Claim 11

L) Replace claim 12 of the January 18th 2005 amendment with the following Examiner amended claim 12:

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Claim 12 --- The method for processing magnetic resonance imaging image information described in **claim 1**, wherein in said interpolating processing step each of the interpolated spectral intensity values obtained by the magnetic transverse relaxation (T2) measurement correspond to the same respective measuring points obtained by the magnetic longitudinal relaxation (T1) measurement. ---

M) Cancel Claim 13

N) Replace claim 14 of the January 18th 2005 amendment with the following Examiner amended claim 14:

Claim 14 --- The magnetic resonance imaging system described in **claim 8**, further comprising a third obtained image information storing portion that stores magnetic resonance imaging spectral intensity image information obtained by a nuclear density measurement. ---

O) Replace claim 15 of the January 18th 2005 amendment with the following Examiner amended claim 15:

Claim 15 --- The magnetic resonance imaging system described in **claim 8**, wherein each of the magnetic resonance spectral intensity values each correspond to a hydrogen nucleus magnetic resonance spectral intensity value. ---

P) Replace claim 16 of the January 18th 2005 amendment with the following Examiner amended claim 16:

Claim 16 --- The magnetic resonance imaging system described in **claim 8**, further having a function of comparing between the linearly calculated new MRI image and a respective image obtained by an X-ray computed tomography. ---

Q) Delete / Remove pages 1-17 of the October 7th 2003 original specification.

R) Insert as a replacement **only** pages 1-12 of the **Replacement Specification** of April 12th 2005.

The following is an examiner's statement of **Reasons for Allowance**:

4. With respect to **Examiner amended dependent claims 4, 6- 8, 12, and 14-16**, these **Examiner amended dependent claims** are considered by the examiner to be **allowable over the prior art of record** because they depend from **examiner amended allowable independent claim 1**, and **the prior art of record** does not disclose or suggest an MRI apparatus/method comprising
5. A method for processing magnetic resonance imaging image information wherein **a magnetic resonance spectral intensity value is measured at each of a plurality of measuring points that are arranged at predetermined intervals along a lengthwise direction, a crosswise direction and a height direction on a bone structure to be measured**, comprising obtaining magnetic resonance imaging (MRI) image information as **a set of the magnetic resonance spectral intensity values measured at each of the plurality of measuring points that are arranged at predetermined intervals along a lengthwise direction, a crosswise direction and a height direction on said bone structure** by using two kinds of spectral intensity measuring methods respectively with respect to the bone structure to be measured, the spectral intensity measuring methods comprising: a magnetic longitudinal relaxation (T1) measurement and a magnetic transverse relaxation (T2) measurement; **three-dimensionally aligning** the magnetic resonance imaging (MRI) image information obtained by the magnetic longitudinal relaxation (T1) measurement with the magnetic

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resonance imaging (MRI) image information obtained by the magnetic transverse relaxation (T2) measurement and **obtaining by interpolation another set of spectral intensity values of the magnetic resonance imaging image information** for both the magnetic longitudinal relaxation (T1) measurement and the magnetic resonance imaging image information by the magnetic transverse relaxation (T2) measurement, **at the same points as the plurality of measuring points used for said predetermined intervals along a lengthwise direction, a crosswise direction and a height direction on said bone structure, and deriving information showing the bone structure as new MRI image information by performing a linear calculation** between the set of spectral intensity values obtained by the magnetic longitudinal relaxation (T1) measurements and the set of spectral intensity values obtained by the magnetic transverse relaxation (T2) measurements **at each of the plurality of measuring points that are arranged at said predetermined intervals along a lengthwise direction, a crosswise direction and a height direction on said bone structure**", in combination. **It is the combination of the claim limitations taken as a whole that constitutes both the novelty and non-obviousness of applicant's claims.**

6. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Examiner's Comment

Priority

7. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Information Disclosure Statement Resolved

8. The article provided by the information disclosure statement filed 10/07/2003, which was initialed with the last office action of October 21st 2004, has now been considered as to the merits of the references written teachings as well as the tables and

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figures, because the applicant has provided the examiner, via the January 18th 2005 amendment with an English Translation of the Japanese article for consideration.

Specification

9. **Pages 1 through 12** of the Replacement Specification filed April 12th 2005 are accepted and approved by the examiner. The replacement-specification with changes made begins on pages 14 through 26 of the April 12th 2005 submission, and is also accepted.

10. The examiner notes that the specification has been replaced because the originally filed Specification, which was an English Version of the original foreign Japanese application was replete with English language and grammatical translation errors, which made the application exceeding difficult to read. In four telephonic interviews with applicant's representative **Susan A. Wolffe Reg. No. 33,58** from April 7th through April 12th 2005. The examiner proposed numerous corrections in order to make applicant's specification more comprehensible, without introducing new matter.

11. One example of the numerous changes which were made but are not considered new matter was the replacement of the word "piece" by the word "slice" throughout the disclosure because, even though the words "slice" and "piece" may be synonymous when the context being described is a "piece" or "slice" of cake, in the art of MRI divisions of an imaged tissue which are displayed are referred to as "slices" not "pieces" of the image. The use of row, column, "slice" in MRI for describing an MRI image matrix in is conventional. The use of "row", "column" and "piece" did not make appropriate contextual sense. Applicant's invention concerns processing MRI images in the form of Image slices, therefore the replacement of the word "piece" with the word "slice" is appropriate and free of new matter.

12. Other translational corrections are also present but no new matter was added. Numerous grammatical corrections were also made in order to make applicant's disclosure readable to one of ordinary skill in the art whose primary language is English as opposed to Japanese.

13. Applicant's amendment's to the specification also include the reciting of the examiner amended claim terminology of claim 1, clearly within the disclosure, so that

the corrected English claims correspond to the invention as originally disclosed, but in a readable English language form.

14. Support for the examiner amended limitations concerning the "plurality of measuring points that are arranged at predetermined intervals along a lengthwise direction, a crosswise direction, and a height direction" for the limitations concerning the set(s) of spectral intensity values are found on pages 2-3 of the original specification as originally filed. All of the other examiner amended corrections were made to keep the singular or plural recited limitations, consistent throughout the claims, and to place the claims in a grammatically proper format so that the claims could easily be read by one of ordinary skill in the art whose primary language is English as opposed to Japanese. No new matter was added by any of the Examiner Amendments to the claims, and the replacement specification of April 12th 2005 pages 1 through 12 are also considered by the examiner to be free of new matter.

Extraneous paper in Replacement-Specification Submission of April 12th 2005

15. The examiner notes that page 13 of the April 12th 2005 replacement specification is not part of the instant application, the serial number at the top of the page indicates that it belongs to a different application. The examiner also notes that page 13 of the April 12th 2005 replacement specification is identified as page 85, however in the instant application there are only 12 corrected specification pages. Clearly page 13 of the April 12th 2005 replacement specification is extraneous.

Drawings

New Formals with corrections Required

16. The following changes to the drawings have been approved by the examiner and agreed upon by applicant:

A) Applicant will amend the explanatory box S1 of figure 7 to read "Conduct T1 measurements(s) and store result of T1 measurement(s) in a first image information storing portion".

B) Applicant will amend the explanatory box S2 of figure 7 to read "Conduct T2 measurements(s) and store result of T2 measurement(s) in a second image information storing portion".

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C) Applicant will amend the explanatory box S3 of figure 7 to read "Align magnetic resonance imaging image information obtained by T1 measurement(s) three-dimensionally with magnetic resonance imaging image information obtained by T2 measurement(s), obtain spectral intensity values at predetermined positions identical to measuring positions of T1 measurement(s) by interpolation of spectral intensity values stored in a second image information storing portion and store result of the above in an interpolating processing result information storing portion."

D) Applicant will amend the explanatory box S5 of figure 8 to read "Obtain difference between a value that has each bit of a spectral intensity value of xth row, yth column, zth slice stored in a first obtaining image information storing portion inverted and a value that has a spectral intensity value of xth row, yth column, zth slice stored in interpolating processing result information storing portion multiplied by a constant **a** and store it in a calculated result image information storing portion." **In order to avoid abandonment of the application, applicant must make these above agreed upon drawing changes.**

Prior Art of Record

17. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

A) **Steines et al.**, US patent 6,799,066 B2 issued September 28th 2004, filed September 14th 2001, which teaches a technique for manipulating medical images including MRI and x-ray images.

B) **Matsuo et al.**, US patent application publication 2004/0150399 A1 published August 5th 2004, filed October 7th 2003. This reference is applicant's originally filed instant application. It is noted for the purposes of a complete record but is not prior art against the applicant's claims.

C) **Reiderman et al.**, US patent 6,278,891 B1 issued August 21st 2001.

D) **Giger et al.**, US patent 5,974,165 issued October 26th 1999.

E) The **Matsuo et al.**, Japanese article "Research of Structural Image Process for Optical Brain Function Measurement" (May 2002) page 55.

F) **Taicher et al.**, US patent 6,285,901 B1 issued September 4th 2001.

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Conclusion

18. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tiffany Fetzner whose telephone number is: (571) 272-2241. The examiner can normally be reached on Monday-Thursday from 7:00am to 4:30pm., and on alternate Friday's from 7:00am to 3:30pm.

19. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Diego Gutierrez, can be reached at (571) 272-2245. The **only official fax phone number** for the organization where this application or proceeding is assigned is **(703) 872-9306**.



TAF

April 16, 2005



Diego Gutierrez
Supervisory Patent Examiner
Technology Center 2800